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CASE REPORT

Flexible Fiberoptic Bronchoscopy Through the Laryngeal Mask Airway in a Small Premature Infant

Ahmet Hakan Gedik[1], Erkan Çakır[1], Ufuk Topuz[2]

[1]Department of Pediatric Pulmonology, Bezmialem Vakif University Faculty of Medicine, İstanbul, Turkey
[2]Department of Anesthesiology and Reanimation, Bezmialem Vakif University Faculty of Medicine, İstanbul, Turkey

Abstract

Flexible bronchoscopy (FB) can be used safely for wider indications in children. Ultra-thin bronchoscopes are used for premature or newborn infants and are of limited diagnostic value. Bronchoscopes with a suction channel, may lead to problems when the nasal passage is narrow, particularly in patients under 2.5 kg. In addition, it may cause bronchospasm and hypoxia in small infants during the procedure because of an almost complete obstruction of the airway. A laryngeal mask airway (LMA) may prevent both bronchospasm and hypoxia because it does not need a nasal route. In addition, the LMA allows positive pressure ventilation during the procedure. We performed FB with a 3.7 mm bronchoscope through the LMA in a 75-day-old and 1910 g premature baby with atelectasis. This is the first and successful FB experience in such a small premature infant reported in the literature using a 3.7 mm bronchoscope through the LMA.

KEY WORDS: Child, flexible bronchoscopy, laryngeal mask airway

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INTRODUCTION

Flexible endoscopy of pediatric airways was first reported in 1978. Since then, the technique has continued to develop, and the number of flexible bronchoscopy (FB) procedures in pediatric patients has increased with the availability of smaller devices. FB in children of the age group of 0-18 years can be used safely for wider indications in children of different weights and ages. Pediatric airway bronchoscopy may involve the inspection of the nose, pharynx, larynx, trachea, and bronchi. Diagnostic indications include the evaluation of stridor, an unexplained or persistant wheeze or cough, possible malformations, recurrent atelectasis or infiltrations, hemoptysis, and collection of specimens. No certain contraindications for bronchoscopy were noted [1]. The laryngeal mask airway (LMA) has been used since 1983, and the use of bronchoscopy via the LMA of infants and children has increased with the availbility of smaller sizes of the LMA [2]. We performed FB with a 3.7 mm bronchoscope via the LMA in a 75-day-old 1910 g premature baby with atelectasis. This is the first and successful FB experience in such a small premature infant reported in the literature using a 3.7 mm bronchoscope through the LMA.

CASE PRESENTATION

A 75-day-old male baby weighing 1910 g was referred to our clinic for examination of recurrent atelectasis. He was born at a gestational age of 28 weeks weighing 1160 g. He exhibited symptoms of having respiratory distress syndrome at birth, and was immediately intubated in the operating room and then transfered to the intensive care unit. In addition, anemia, hypoglycemia, and recurrent pneumonia were also appropriately treated. He had several extubations and intubations due to the recurrent atelectasis after extubations. He needed mechanical ventilation because he could not tolerate the extubation. He was referred to our bronchoscopy unit for recurrent atelectasis in the same area. Chest X-ray revealed atelectasis in the right upper lobe.

The patient's consent was taken from the parents. The infant had been brought to our clinic in a transport incubator intubated with a 3.5 mm internal diameter tracheal tube. Mechanical ventilation was necessary; oxygen saturation was 96%. He was looking well and very comfortable under mechanical ventilation; however, chest auscultation revealed different breath sounds throughout the left and right lung. Laboratory studies did not indicate any infectious disease.

At adequate room temperature and after having applied the routine anesthesia monitoring standards, FB was performed to evaluate the respiratory airways. The internal diameter of the endotracheal tube was not sufficient to allow the use

Address for Correspondence: Ahmet Hakan Gedik, Bezmialem Vakıf Üniversitesi Tıp Fakültesi, Çocuk Göğüs Hastalıkları Bilim Dalı, İstanbul, Türkiye Phone: +90 505 615 18 24 E-mail: ahakangedik@hotmail.com

of a bronchoscope, thus necessitating mechanical ventilation and withdrawal of the endotracheal tube. An anesthesiologist induced anesthesia using 0.1 mg of atropine and 0.1 mg/kg of midazolam for premedication, 1 mg/kg of propofol, and 1 mg/kg of cetamine. A size 1 LMA was inserted successfully and ventilation (manually assisted) was non-problematic. The FB was performed by a pediatric pulmonologist. The LMA could be used as a conduit both for a bronchoscope and mechanical ventilation with a rubber valve-fitted opening of an angle piece attached to the outer aperture of the LMA (Figure 1). We used an FVB with an outer diameter of 3.7 mm (Pentax EB-1170K, Hoya Corporation, Tokyo, Japan).

Examination of the patient revealed severe edema of the vocal cords. Sixty percent of the lumen was obstructed by residual granulation tissue in the subglottic region (Figure 2a). After passing the obstruction, nodular, fragile, and hyperemic mucosa was seen throughout the trachea and carina. The anatomic structure of the carina was lost. Granulation tissue and nodular formations obstructed up to 80% of the lumen of the bilateral main bronchus (Figure 2b). Viscous secretions were aspirated and the bronchoscope could not be passed through the obstruction. The patient was hemodynamically stable and no complication was noted. The patient was then reintubated and transferred to the intensive care unit.

DISCUSSION

Pediatric FB is used for ever wider indications of children's respiratory problems and complications; however, the decision to perform FB in children should always be made on an individual basis after consideration of a patient's characteristics. Stridor or noisy breathing is the most common indication in infants, whereas the evaluation of airway obtruction, which may involve the upper or lower airway or both, is the most common indication for FB in children [3]. According to Barbato et al. [4], recurrent or persistant pneumonia, atelectasis, and wheezing that does not respond to therapy are the most common indications for FB in children. Our patient had recurrent atelectasis and could not be extubated because of it.

Bronchoscopes of varying diameters are used in pediatric patients. Ultra-thin bronchoscopes offers new diagnostic opportunities, particularly to neonatologists [5]. Furthermore, ultra-thin bronchoscopes are of limited diagnostic value when excessive bronchial secretions obstruct the view of the working field because of the abscence of the suction channel. In addition, bronchoalveolar lavage cannot be evaluated, and these bronchoscopes cannot be used theurapeutically in some cases such as atelectasis. In the literature, the youngest patient (a premature 1-week-old infant weighing 600 g) on whom an infant bronchoscope was used was part of a large FB series [6]. Nussbaum [6] used a 2.2 mm bronchoscope in preterm neonates and intubated infants where the small glottic or endotracheal tube size renders the 3.5 mm bronchoscope useless. He determined that a 2.2 mm bronchoscope was of limited value when excessive bronchial secretions obstructed the view of the working field because of the absence of a suction channel.

Figure 1. Using the LMA with a conduit for a bronchoscope [Diameter of 3.7 mm (Pentax EB-1170K, Hoya Corporation, Tokyo, Japan)] with a rubber valve-fitted opening of an angle piece attached to the outer aperture of the LMA.
LMA: Laryngeal mask airway.

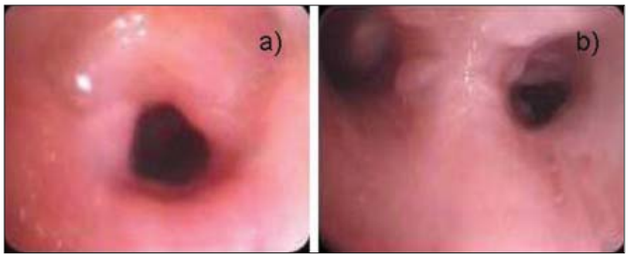

Figure 2. a, b. Obstruction of subglottic region up to 60% by residual granulation tissue (a). Anatomic structure of carina and obstruction of the lumen of the bilateral main bronchus up to 80% with granulation tissue and nodular formations (b).

Pediatric bronchoscopes with diameters of 2.8, 3.5, 3.7, and 3.8 mm have suction channels. The use of a bronchoscope with a suction channel, particularly in patients under 2.5 kg, may lead to problems when the nasal passage is narrow. In addition, it may cause bronchospasm and hypoxia in small infants during the procedure because it almost completely obstructs the airway. The LMA can prevent both bronchospasm and hypoxia because it does not need a nasal route beside allowing positive pressure ventilation during the procedure. Somri et al. [7] reported a bronchoscopy of a 2.2 kg neonate with a 3.3 mm bronchoscope via the LMA. Lan et al. [8] performed 24 FB with a 3.6 mm fiberoptic pediatric bronchoscope without using the LMA and reported that the youngest patient was a 4-day-old 1672 g baby. The usage of

3.6 mm or larger bronchoscopes is rare in small infants. We performed FB successfully with a 3.7 mm bronchoscope through the LMA in a 1910 g premature infant because of dense mucus plugs and atelectasis and no complication was encountered. This is the first case reported in the literature using a 3.7 mm bronchoscope through the LMA in such a small premature infant patient. Although 2.8 mm bronchoscopes may be more suitable for FB in such small infants, all sizes of bronchoscopes cannot be present in all units, particularly in developing countries. Moreover, no pediatric flexible bronchoscopy unit, except our unit, has a 2.8 mm flexible bronchoscope in Istanbul.

Larengeal mask airway is a safe and effective procedure for pediatric FB and allows the evaluation of the airway during the spontaneous ventilation. Nussbaum et al. [9] studied FB via the LMA in a group of children and concluded that the procedure had been well-tolerated in them and that no complication emerged. Naguib et al. [2] demonstrated in 1947 procedures that FB through the LMA rendered the lowest rate of overall procedure-related complications when compared to other routes (nasal or endotracheal entubation). The LMA may complicate the assessment of the upper airway abnormalities such as laryngomalacia as a disadvantage. To facilitate the procedure in children and infants who are intubated and ventilated, it may be necessary to alter the method of airway maintenance from an endotracheal tube to a laryngeal mask or a face mask because of an unsufficient diameter of the endotracheal tube for bronchoscopes. Based on their advantages and disadvantages, the LMA could provide a better airway than other conventional airways [10]; however, data are limited on the use of these devices in small, premature infants.

In conclusion, the LMA is a safe and effective route for pediatric FB. A 3.7 mm bronchoscope may be used through the LMA in small infants, particularly those who have atelectasis and viscous secretions. Additional cases of successful procedures are required to establish this method as a standard procedure in small infants.

Informed Consent: Written informed consent was obtained from the patient's parents who participated in this case.

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